Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2019-73-RC2, 2019

Geoscientific Model Development Discussions

Interactive comment on "A regional atmosphere-ocean climate system model (CCLMv5.0clm7-NEMOv3.3-NEMOv3.6) over Europe including three marginal seas: on its stability and performance" *by* Cristina Primo et al.

Anonymous Referee #2

Received and published: 28 August 2019

This paper adresses the development of a new Regional Climate Model focused on the EURO-CORDEX domain. The model couples together the COSMO-CLM land-atmosphere regional climate model with two different configurations of the NEMO ocean model designed to model 1) the Mediterranean Sea (NEMO-MED) and 2) the Nordic seas (NEMO-NORDIC). A 100 year long simulation is presented.

I think that the technical objective of showing the stability and robustness of the RCSM has been achieved. The comparison of a set of key variables between the coupled, uncoupled simulations and various observations is convincing and demonstrates the

correct behaviour of the system. The technical work behind the development of such system is important and worth to be shared with the climate modelling community.

However, I have the feeling that the reader could be somehow frustrated on the scientific side. Overall, I think that the paper is mainly descriptive and lacks some attempt of explanation of the observed results in agreement with the objectives claimed in the abstract and introduction : better understanding of the european regional climate, added value of three marginal seas and better representation of extreme events.

Somehow, on the one hand I would try to give more details on the technical aspects so the paper could be used as a reference for other similar works. But on the other hand, I would be less ambitious regarding the claimed objectives and I would reduce the number of results figures but trying to propose some arguments explaining the difference between the two simulations. Again, I acknowledge the great amount of work behind such a simulation and the difficulty to produce a general and concise scientific content with a long simulation.

See below a list of questions and suggestions :

- In the atmospheric model, you mention a variety of parametrization scheme, could you be more precise about it ? micro-physics scheme ? convection scheme ? aerosols climatology ?

- There is no reference to the land component of the system, is there any routing of water ? what about the vegetation ? change of landuse throughout the 100 years ?

- Could you explained the motivations for the 2 step methods providing the lateral boundary conditions ? What is the motivation to do a 3D relaxation of the ocean towards a simulation performed with another atmospheric forcings ?

- The exchanged variables and the according coupling time-step should be listed

- An important point of such a climatic run is the initial state : is there any spin-up ? spin-up of the ocean only ? spin-up in coupled mode ?

- Regarding the system performances, instead of nodes could you state the number of cpu cores used ? and gives some numbers about the cpu-time needed for the run.

- the 3 models are running simulteanously and eventually wait for one another, so to be faster it would be interesting to optimize the slowest model i.e. NEMO-BALTIC (or NEMO-NORDIC should be consistent all along the manuscript). It looks like you could move some cores from NEMO-MED to NEMO-NORDIC to make it faster and at least decrease the waiting time in COSMO-CLM. Any comments on that ? and on the scalability of the system ?

- I find surprising the 3.6 ratio between the atmosphere only and coupled since atmosphere is running on the same number of cores and there is not that much wainting time. How do you deal with the I/O ? Could it be some latency due to the writing of the other models outputs ?

- in the analysis of the SST, a comparison is done between the result of the RCSM simulation and the prescribed SST coming from a global similation at low resolution. In my opinion, the comparison not only shows the impact of retroaction through coupling of atmosphere and ocean models but also the impact of using differents models and resolution. Should we not compare the SST from an ocean-only simulation forced by a COSMO-CLM run (driven by a prescribed SST) and the SST from the RCSM ? Could you state something about this point ?

- Do you have any hypothesis regarding the various bias we observe ?

- about density histograms, at first it was not obvious to me that the dark pink was in fact the blue lying behind the light pink

- could you mention the convention used for the boxplots ?

- for figures of differences, could you precise the sign of the difference (simulation - observation, for instance)

- I find interesting the analysis of extreme events, but you could perhaps show less

figures or indices and make same asumptions explaining the better behaviour of the coupled model, and why on some indices and not on others ?

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2019-73, 2019.